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ABSTRACT

Progress in a primary-grade reading program was determined for 106 first-born, second-grade students at the end of the school year. Previous data available for this sample included Thomas-Chase-Birch temperament ratings, family intactness and socioeconomic status at age four, and Metropolitan Readiness Test scores at age six. The value of these variables for predicting reading achievement was determined by a series of regression analyses and in the context of a path analysis model. (Author)

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TEMPERAMENT, SELECT HOME ENVIRONMENT CHARACTERISTICS AND READING READINESS AS PREDICTORS OF READING PROGRESS

T. J. Brown

The purpose of this study was to investigate the relationships among selected behavioral, environmental and achievement variables for young children. Specifically, preschool measures of socioeconomic status, family intactness and child temperament characteristics, together with subsequent measures of reading readiness and reading progress were included in a hypothesized causal model. Data from these measures were primarily analyzed according to the principles of path analysis. The hypothesized causal orderings among the variables are graphically portrayed by the path model in Figure 1.

The hypothesized causal orderings were supported both on the basis of temporal sequence and reason. The results of measures which preceed in time must logically represent portions of the cause, rather than the effect, of subsequent variables. Socioeconomic status and family intactness are presumed to cause temperament, in the path analysis sense of cause, since the relative level at which the reverse could be true would be, by rule of reason, inconsequential at best.

Path analysis permits a determination of the validity of hypothesized causal orderings. In addition, the magnitude of effect that one variable has on another, both directly and indirectly through mediating variables, can be determined. For the model under consideration, it was hypothesized that reading readiness would have the greatest direct contribution to subsequent reading progress due to its temporal proximity and similarity to the criterion variable. Temperament was hypothesized to demonstrate the next largest direct contribution, mediating much of the influence of socioeconomic status and family intactness.

The explanatory value of the temperament measures was of particular interest to the author both for what they might contribute in addition to reading readiness and as an alternative, more meaningful predictor of school performance than socioeconomic status and family intactness. The temperament measures were in the form of nine behavor rating scales. The scales purport to measure the how of behavior as opposed to what the child does, why he engages in various behavior or even how well he performs. As such they are concerned with elements of style theoretically rooted in biological factors. Temperament theory is not, however, exclusively constitutional. It is recognized that behavior is a representation of the dynamic interaction of both biological and environmental influences (Thomas, et.al., 1968). Thus it was reasonable to hypothesize that socioeconomic status, family intactness and temperament were, to some degree, functionally related as indicated by the model.

In addition to theoretical interests, there appeared to be important practical implications from the determination of the predictive and explanatory value of the temperament scales. As an early and significant predictor of subsequent readiness and reading performance, the scales could provide guidance in the generation of curriculum and associated professional training designed to favorably alter selected behavior characteristics. An alternative contribution would be guidance in the provision of educational environments which would favorably accomodate characteristics that are practically inalterable.

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METHOD

Subjects

Ss were 106 second grade students of the Sioux Falls Public School District who were participants as preschoolers in the Sioux Falls Early Childhood Project. The goals of the project were to provide developmental enrichment as well as identification and remediation of present or potential developmental deficits. All district families having a first-born child whose birth date was between November 1, 1967 and October 31, 1968 were invited to participate. The project began in the spring of the second school year prior to kindergarten. Initially, group enrichment sessions were conducted by teaching teams composed of a certified teacher, a college student, a high school student and a parent. The average group had 16 children. As the project continued it was possible for many teaching teams to have additional professionals in lieu of students.

Data Collection

Temperament ratings (TEMP) were gathered periodically in the course of the project, utilizing the nine dimensions of the Thomas-Chess-Birch temperament scales. These dimensions included: 1) Activity level; 2) Rhythmicity; 3) Distractability; 4) Response to new situations; 5) Adaptability; 6) Attention span and persistence; 7) Threshold of responsiveness; 8) Intensity of reaction; 9) Quality of mood. The ratings were made by the professional members of the teaching teams and were averaged when a child was rated by more than one person. The set of ratings considered in the model was gathered when the children were of average age 4 years 2 months.

Family interviews were conducted immediately prior to the beginning of the project and for new participants thereafter, i.e., when the children were of average age 3 years 11 months. Data for determining socioeconomic status (SES) and family intactness (INT) were obtained in the course of these interviews. SES consisted of two measures: 1) The number of years of education of the primary breadwinner in family residence; 2) The occupational level of this same parent as measured by the Hollingshead Index of Social Position. Families having two parents in residence at the time of the interviews were considered intact, with all others considered nonintact.

At the end of kindergarten Metropolitan Reading Readiness Test scores (MET) were gathered. Reading achievement was indicated by reading group placement (READ) in the last grading period of the 1975-76 school year. The school district had established 14 reading levels for the primary grades. As second graders, Ss were expected to be rather normally distributed over approximately six of these levels, which was subsequently found to be the case.

Procedure

Unfortunately, it was necessary to eliminate INT as a variable in the model. The original group of 256 participants in the preschool project included appoximately 15% from nonintact families. Four years later the remaining 106, for whom data was available on all variables, included only one child from the former nonintact families, providing insufficient variability to meaningfully evaluate the model.

Data for all remaining variables were standardized. A regression analysis was performed with the six MET subscores, the nine TEMP dimensions and the two SES measures as independent variables, and with READ as the dependent variable. The resultant beta weights were used to combine subscores, yielding a single MET, TEMP, and SES score for each S. Such a procedure for combining a cluster of variables to form a single variable score is recommended by Coleman (1972). Scores for these derived variables were then standardized, and three regression analyses were performed to obtain path coefficients for the model. Nonsignificant paths ($\alpha = .05$) were deleted from the model and further regression analyses were performed to obtain revised coefficients. To evaluate the adequacy of the model, actual correlation coefficients among the variables were compared with those produced by performing appropriate algorithms with the coefficients of the revised model (Spady and Greenwood, 1970). Since the model was not confirmed, analyses were performed to verify the causal orderings that best reflected the data.

RESULTS

The coefficients for the model after the deletion of nonsignificant paths are provided in Figure 2. It is evident that MET and TEMP provided direct and significant contributions to READ and that MET did not significantly mediate the contribution of TEMP. The contribution of SES to READ was largely mediated by both MET and TEMP. The coefficients for the paths from SES are negative because MET and TEMP largely accounted for the positive variation of parent education level with READ in the composition of the clustered variables. Three of the six correlations derived from these coefficients, however, did not approximate the actual correlations among the variables, as indicated in Table 1. It should be noted that the discrepancy criterion of .05 represents a somewhat subjective judgment of adequate approximation, but has been recommended by Spady and Greenwood (1970). Two of the three excessive discrepancies were due to the magnitude of the coefficient for the deleted path from TEMP to MET, which was approaching significance. Had this path been retained, only the correlation between READ and SES would have remained discrepant, and to a slightly lessor extent.

The results nonetheless suggested that the causal orderings should be examined more carefully. The correlations of all possible three-variable subsets were analyzed to determine the most appropriate causal order of each subset, as follows:

SES (1) → MET (3) → READ (4)

$r_{43} = .652$ $\qquad (r_{43})\ (r_{31}) = -.179$

$r_{31} = -.275$

$r_{41} = -.138$

Since -.179 reasonably approximated the actual correlation of -.138 between SES and READ, and since all other orderings provided very poor approximations, the above causal order for these variables was accepted. Such an approach is consistent with the efforts of Hilgendorf and colleagues (1967). The following

order was also accepted:

SES ⟶ TEMP ⟶ READ

None of the possible orderings among SES, TEMP and MET were adequate. The following causal orderings were verified for TEMP, MET and READ:

(1) TEMP ⟶ READ ⟶ MET

(2) MET ⟶ READ ⟶ TEMP

(3) MET ⇕ TEMP ⟶ READ

Since the first two of these were chronologically implausible and could not be incorporated with the other accepted orderings, the third was accepted. In addition, it was hypothesized that the failure to confirm the initial model and the inability to establish an adequate order for SES, TEMP and MET were because the residuals of TEMP and MET were correlated, i.e., these two variables were in part caused by a common variable or variable set not included in the the model. Order (3) was consistent with this hypothesis as well as the other accepted orderings.

It was therefore necessary to revise the model by combining MET and TEMP, using the procedures previously described for deriving a composite variable. Path coefficients for this model, after deletion of the nonsignificant path from SES to READ are provided in Figure 3.

Multiplying the two coefficients yielded a value of -.210, which is again somewhat discrepant with the correlation between SES and READ. Consequently, alternative models with other combinations of variables were tested. These models proved to be less adequate. It was therefore decided that the data best fit the initial model with the path from TEMP to MET retained, and with the understanding that the inadequacies of the model appear to be due to a degree of correlation in the residuals of MET and TEMP.

DISCUSSION

The results support the hypotheses that MET and TEMP would each exercise a significant direct effect upon READ, and that these variables would mediate the effect of SES upon READ. These findings serve to substantiate the utility of the temperament scales as a predictor of subsequent achievement in reading and as a potential diagnostic tool for prescribing curricula. Generalization of these findings should, however, recognize some of the characteristics of this sample. Though the sample was reasonably representative with respect to SES, Ss were primarily of Scandanavian-American descent with less than 2 percent Black or Indian. However, the fact that all Ss were first-born children is perhaps deserving of greatest consideration. Numerous studies have indicated birth order to be correlated with a variety of behavior and achievement indices. Unfortunately, the effect of Ss being first-borns upon the resultant coefficients is, at this time, largely a matter of speculation.

The evaluation of the model indicated, by virtue of the probability of correlated residuals, that MET and TEMP were to some degree caused by a common

variable set external to the model. Perhaps this is due to the generic nature of each of these measures and the relative stability of the characteristics they address. MET is reasonably akin to an IQ measure and temperament theory stresses the importance of genetic contributions to temperament characteristics. That TEMP and MET are the product of some common influences would not diminish their utility as predictors of subsequent achievement. Providing an improved understanding of the causal relationships among the variables should be a focus of future research.

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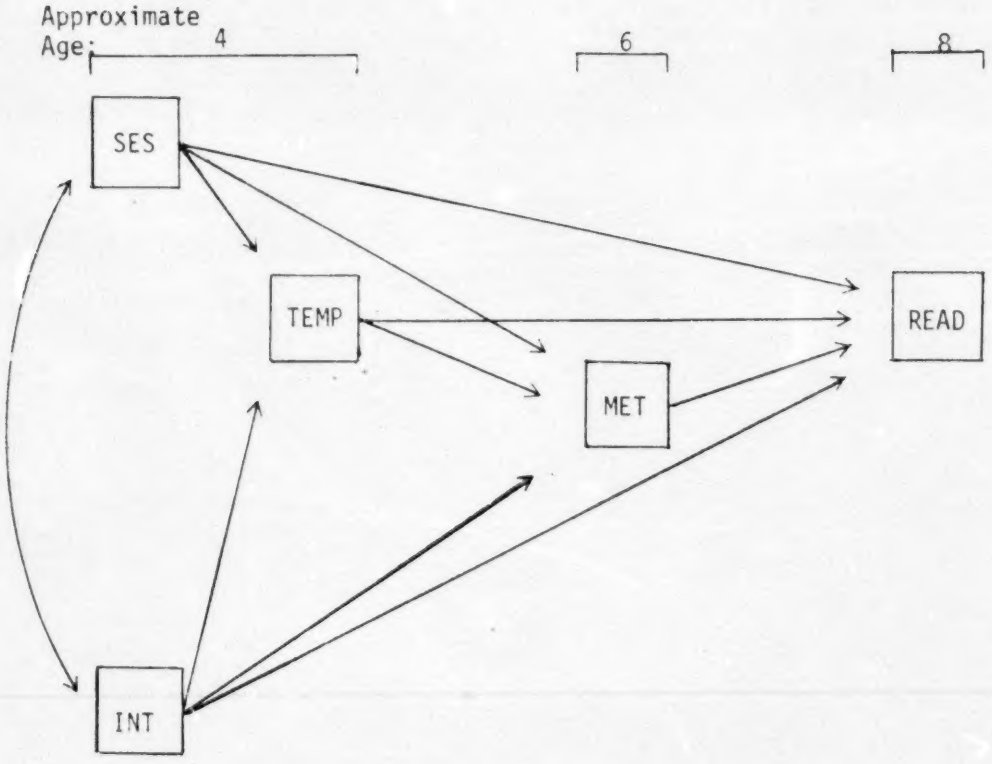

Figure 1. Initial Hypothesized Model

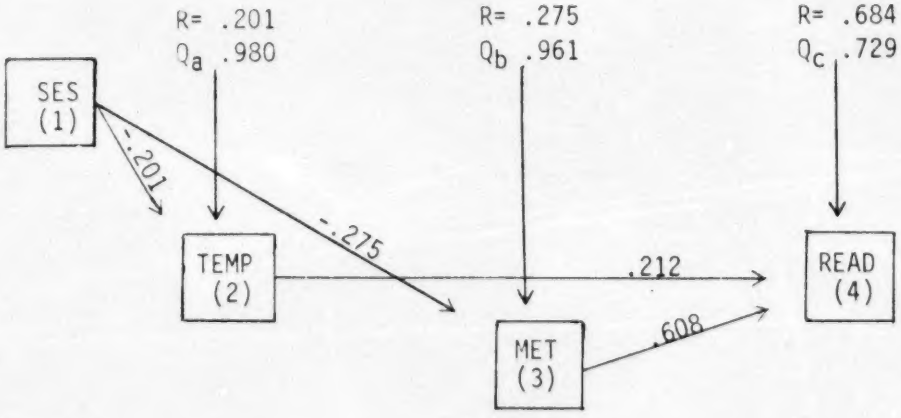

Figure 2. Coefficients for Revised Model After Deletion of Nonsignificant Paths

Table 1. A Comparison of Actual Correlation Coefficients and Coefficients Derived From the Model.

		ACTUAL			
		SES	TEMP	MET	READ
DERIVED	SES		-.201	-.275	-.138*
	TEMP	-.201		.205*	.337*
	MET	-.275	.055*		.652
	READ	-.210*	.246*	.620	

*Discrepancy > .05

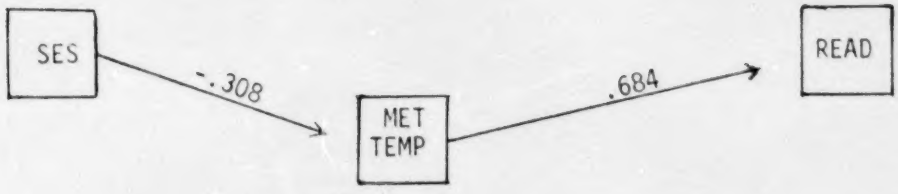

Figure 3. Coefficients for Best-Fitting Model